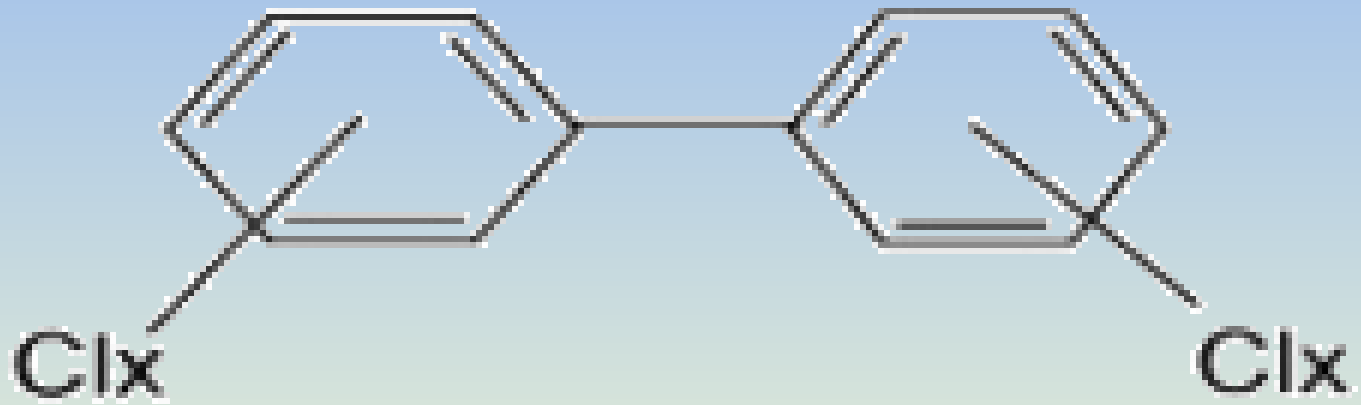
PCB TMDL Monitoring Data Quality

VPDES Point Source Discharges



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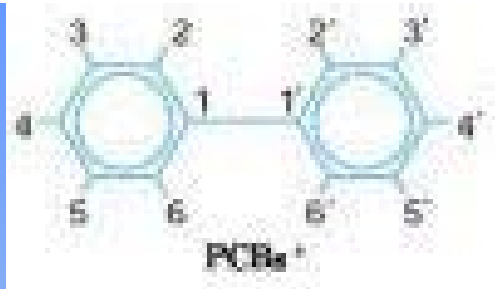
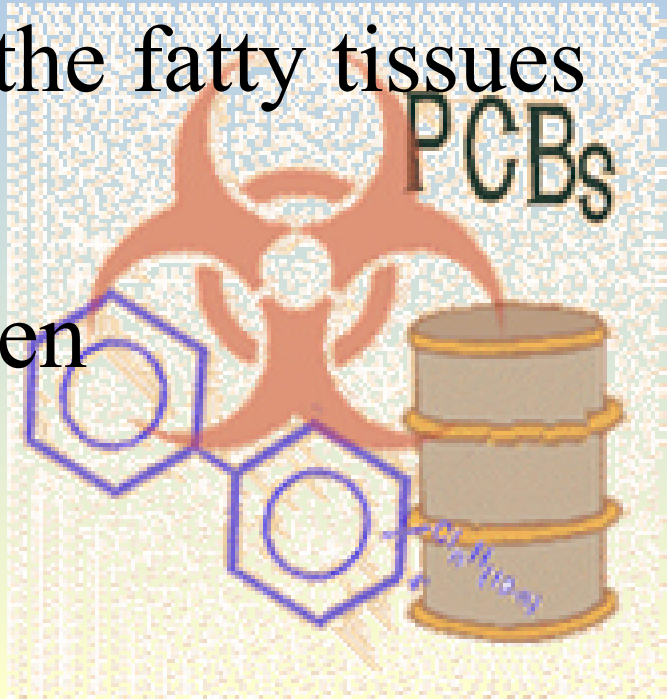
VADEQ
June 11, 2007

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

PCB Characteristics



- Most stable organic compounds known
- Very hydrophobic – attach to organic particles in soil and sediment
- Lipophilic – accumulate in the fatty tissues
- Volatilize to atmosphere
- Listed as probable carcinogen



PCB's

- Man-made organic chemicals with a biphenyl base structure and 209 possible chlorine substitution patterns.
- Terminology: aroclors, congeners, homologs.
- Properties: Hydrophobic, tend to accumulate in sediments and tissues
- Probable liver damage and carcinogen

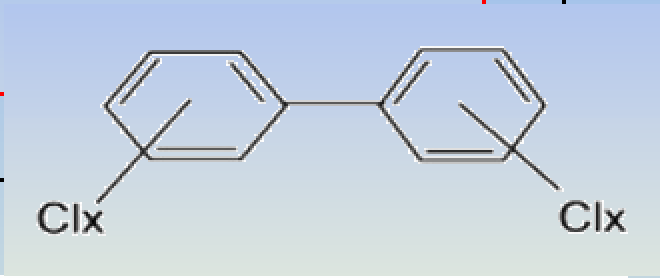


TABLE 7

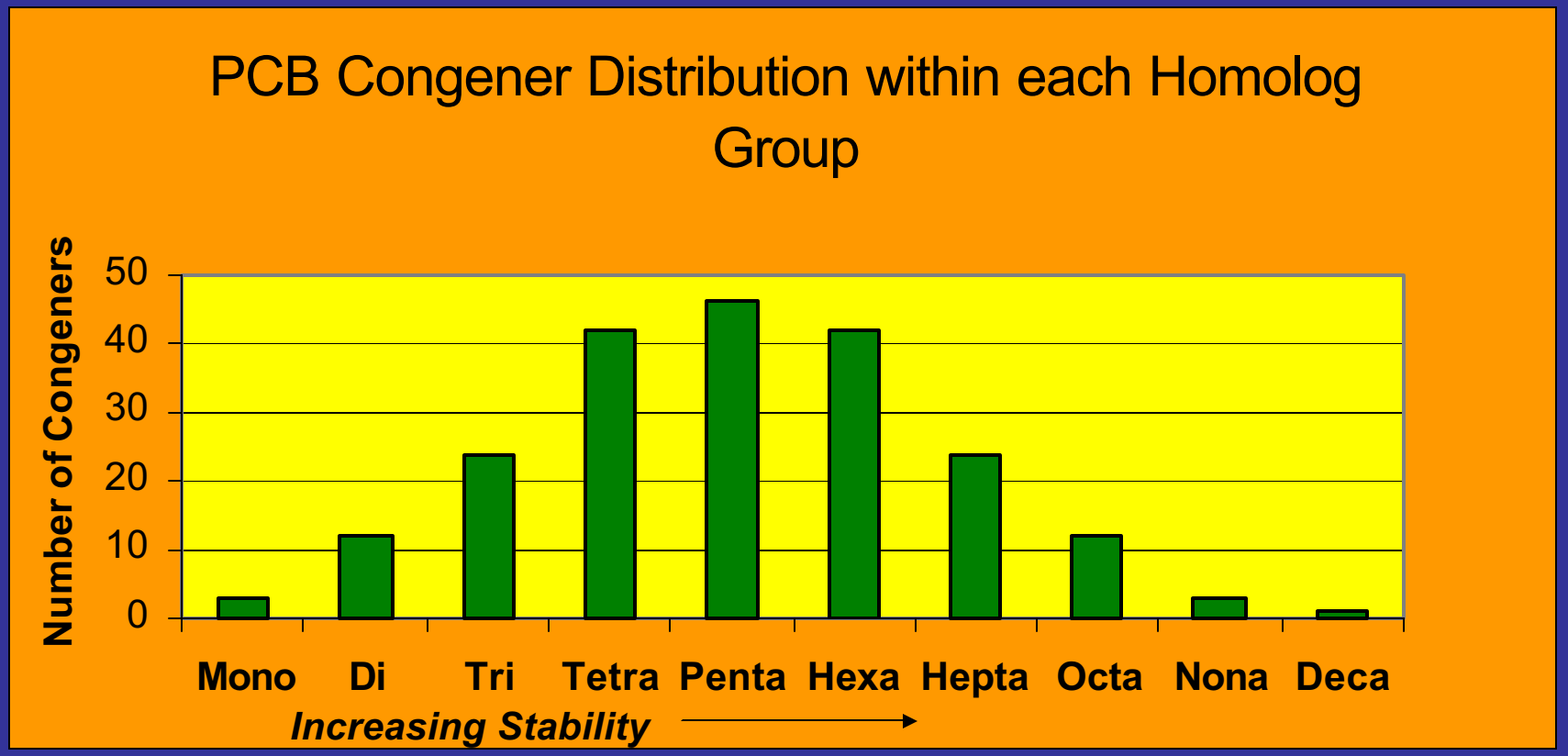
SPECIFIC PCB CONGENERS IN AROCLORS

Congener	IUPAC number	Aroclor 1016	1221	1232	1242	1248	1254	1260
Biphenyl	–		X					
2-CB	1	X	X	X	X			
23-DCB	5	X	X	X	X	X		
34-DCB	12	X		X	X	X		
244'-TCB	28*	X		X	X	X	X	
2'3'5'-TCB	44			X	X	X	X	X
23'44'-TCB	66*					X	X	X
233'4'6-PCB	110						X	
23'44'5-PCB	118*						X	X
2'3'44'5'-HCB	153							X
2'3'44'5-HCB	138							X
2'3'44'5'5'-HpCB	180							X
2'3'33'44'5-HpCB	170							X

PCB Homologs

Homolog	Abbreviation	Cl Substituents	PCB Congeners
Monochlorobiphenyl	MoCB	1	3
Dichlorobiphenyl	DiCB	2	12
Trichlorobiphenyl	TrCB	3	24
Tetrachlorobiphenyl	TeCB	4	42
Pentachlorobiphenyl	PeCB	5	46
Hexachlorobiphenyl	HxCB	6	42
Heptachlorobiphenyl	HpCB	7	24
Octachlorobiphenyl	OcCB	8	12
Nonachlorobiphenyl	NoCB	9	3
Decachlorobiphenyl	DeCB	10	1

PCB Homolog Distribution



Data Quality Objectives

To establish guidance and procedures for implementing PCB point source monitoring through the VPDES permit program for development of TMDLs

- ensure representative and comparable data
- adopt sampling and analytical procedures

- **Field Sampling Program**
  - **Sample type & volumes**
  - **Number**
  - **QA/QC Requirements**
- **Analytical Services**
  - **Data Quality Standards**
  - **Data Delivery (electronic)**
  - **Data Validation**

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Data Quality Objective

- State Problem → PCB TMDL
- ID Questions → ID sources
- ID Information → Point Sources
- Define Study → Guidance
- Decision Rule(s) → Monitoring Protocol
- Limits – errors → Analytical SOP
- Adaptive mgmt → Adjustments

Contamination

? ? ? ? ? ? ? ?

Method 1668A

- Extreme sensitivity (8-11 pg/l)
- Prone to external contamination in the field and laboratory
- Sample contamination is normal
  - elevate the practical detection limit and
  - Increases variability within and between samples

Contamination can not be eliminated, but reduce potential sources or make adjustments

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Composite samples

- more representative of the temporal variability of PCB concentrations but
- more likely to be impacted by sample contamination than grab samples.

Option 2
Composite Grab Samples

- Collect 1 or more instantaneous samples
  - Collect sample at a pre-determined frequency (e.g. 4, 6, or 8 hour intervals)
  - Composite aliquots (in laboratory) for analysis

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Sample volume
- **2 liter**
- **cost & contamination**

Issues
Mr. Dodson

a) Will the samples be collected over a period of one year on a quarterly and bi-monthly basis or will permittees be allowed to collect samples on an irregular basis during the year?

b) Will the collection of wet samples be allowed to be lump together during the rainy season or will they have to be spread out over the year and will the increase in plant flows caused by melting snow be acceptable as wet sample conditions?

Data Quality Objectives

- **Field Sampling Program**
  - Sample type & volume
  - **Number (1 min wet & dry; 3 optim wet & dry)**
  - QA/QC Requirements
- **Analytical Services**
  - Data Quality Standards
  - Data Delivery (electronic)
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Data Quality Objectives

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Analytical Requirements QA/QC

- Qualified Laboratories – ability to perform method
- Adhere to 1668A QC requirements
  - Method Blanks
  - Spike Recoveries (^{13}C labeled Congeners)
  - IPR/OPR (Initial/On-going Performance & Recovery)
- Rinsate Blanks (none issue composite grabs)

Analytical Requirements

- Chromatography column
- Coeluting congeners (ND)
- Congener sensitivity (5-10 pg/L)
- Replicates (backup)
- Method blank decision rules
  - Contamination & reanalysis
- Data reporting
- Data validation

Deliverables

Standard Operating Procedures

- Field monitoring
- Analytical protocals